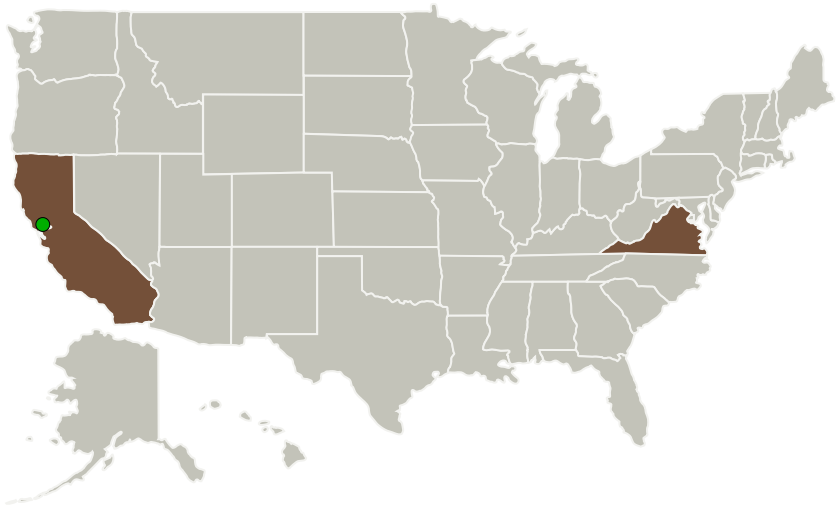
Enhancing the efficiency of Climate and Weather Simulation in High Performance Computing Environments, Phase I

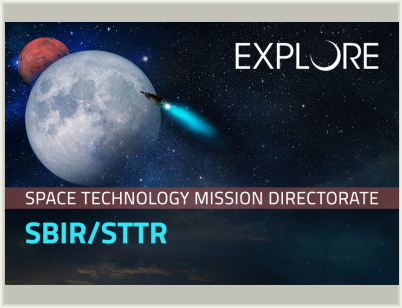
Completed Technology Project (2012 - 2012)

Project Introduction

A central focus of NASA's Global Modeling and Assimilation Office (GMAO) atmospheric general circulation modeling effort is the development of an atmospheric model suitable for data assimilation, weather forecasting, and climate simulation. Ongoing developments are focused on highly parallel processing, global simulations of increasing resolutions, and increased coupling of the earth system's process models. While model computation scales very well with number of available processors, a major constraining factor on the efficiency of these simulations is the input processing of Terabyte-size source data files used by the gridded component models. Our objective in this research is to increase the efficient use of CPU time associated with these simulations by paralleling I/O processing operations using an 'I/O Staging Server' which captures and makes available the required source data asynchronously with the simulation run. More efficient I/O for reading model restarts and boundary conditions, and writing model output and checkpoint files will free up processing resources that are currently idling during I/O. As a result, we will realize a significant increase both the number of models that can be involved in the simulation and the achievable resolutions of the grid components. It is estimated that currently up to 25% of a forecast run is consumed by I/O, a factor we think can be reduced by at least 50% or more through the use of State-of-the-art I/O processing approaches and supporting software infrastructure.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Tellus Applied Sciences, Inc.	Lead Organization	Industry	Williamsburg, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

February 2012: Project Start

August 2012: Closed out

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tellus Applied Sciences, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

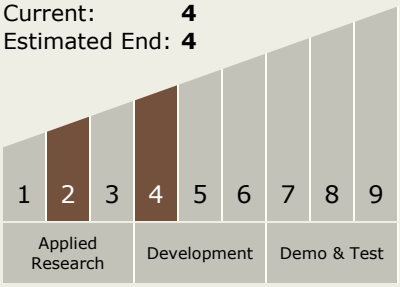
Carlos Torrez

Principal Investigator:

Atanas L Trayanov

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.1 Radiation Hardened Extreme Environment Components and Implementations

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System